Open Automated Demand Response Specification Poised to Become Smart Grid Standard, Berkeley Lab Researchers Say

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Amid increasing demand for energy, those working to transform the existing U.S. electric grid into a smart grid are taking a vested interest in Automated Demand Response (Auto-DR) technology. With Auto-DR, electric reliability events or high prices from supply-side systems are structured to trigger automatic reduction of demand-side end-use electric loads. This process temporarily reduces electric supply constraints and reduces price volatility. Such automatic load reduction helps bring down peak demand, which is the highest period of electricity consumption and often the most expensive.

Auto-DR can improve electric grid reliability and reduce electricity costs by preventing costly outages and reducing average electricity prices. The Auto-DR technology is not effective in a vacuum or without a standardized information exchange for both price and reliability signals. That's where the proposed standard called Open Auto-DR (OpenADR) comes in.

What is Automated Demand Response?

On hot summer days, the increased aggregate energy demand from air conditioners in homes and large buildings, plus lights, freezers and other appliances operating across the United States can cause electricity demand spikes and supply and demand imbalances. To decrease a facility's electricity demand during critical times, electricity service providers, such as utilities and independent systems operators, use commercial Auto-DR programs that send signals to major energy users, including residential and commercial buildings, public and government facilities, and industrial plants. The signals, which are programmed to link to pre-programmed control strategies, automatically shed end-use equipment loads to reduce the grid scale electric power. The load shift and shed strategies are pre-determined and programmed by the building manager to minimize impact to occupant comfort and the facility's operational needs.

Utilities often incentivize building and facility owners to participate in the Auto-DR program. However, facilities, utilities and other entities often use different communication signals for the systems demand response. So researchers at the Department of Energy (DOE)'s Lawrence Berkeley National Laboratory (http://ase.org/associate/lawrence-berkeley-national-laboratory) (Berkley Lab) created a standardized communication specification to address the many "languages" spoken by the systems along the electric grid.

Auto-DR and OpenADR

Released as the "OpenADR communications specifications" by Berkeley Lab in 2009, OpenADR can be used universally among different utility and grid operators, buildings and industrial facilities, and new and emerging DR markets. This "open" capability automates response signals between utility companies and consumers, using the Internet to interoperate with different energy devices for a speedy and reliable response.

"The OpenADR specification uses open, non-proprietary, industry-approved data models—any interested party can develop products around it," Mary Ann Piette, research director of Berkeley Lab's Demand Response Research Center, said in a press release (http://newscenter.lbl.gov/press-releases/2009/04/27/openadr-specification/) .

The Road to an OpenADR-Enabled Smart Grid

Berkeley Lab started developing OpenADR in 2002. Funded by the California Energy Commission Public Interest Energy Research program, Piette and her team of researchers brought the OpenADR specification to the attention of the National Institute of Standards and Technology, which last year selected OpenADR as one of the first smart grid standards for demand response and distributed energy resources and incorporated OpenADR into its smart grid interoperability standards roadmap.

Berkeley Lab recently received new government and state grants to advance OpenADR outside of California. And in May 2010, Honeywell (http://ase.org/associate/honeywell) joined Southern California Edison (http://ase.org/associate/southern-california-

edison) as partners in advancing Auto-DR using OpenADR as part of a DOE Smart Grid Investment Grant.

"Many major controls companies, utilities, and grid systems operators have deployed OpenADR-based programs that reduce peak electric demand by tens of megawatts," Piette said in a Berkeley Lab newsletter (http://eetd.lbl.gov/newsletter/nl31/eetd-nl31-1-smartgridstd.html) . She noted that manufacturers across the nation are bringing OpenADR to the marketplace through products that link to the power grid and provide ADR capabilities to homes, offices and industries.

Currently, California is OpenADR's largest consumer, and is followed by Seattle, New York, Florida and Nevada, as well as some parts of Canada. "Internationally, countries such as India and South Korea have inquired about using OpenADR for their evolving power grids," said Girish Ghatikar, a program manager at Berkeley Lab who oversees OpenADR standards development, as well as other energy-related technologies.

Becoming a Standard

Berkeley Lab researchers believe that OpenADR will become widely adopted as building equipment and control manufacturers develop smart grid-friendly products that speak the same language.

"Once power operators and building systems abide by a standard communication language, technologies, facility managers and commercial/industrial utility customers can more easily integrate with OpenADR electric grid programs and—ultimately—generate lower cost, faster and more reliable demand response that is scalable," Ghatikar said.

OpenADR's implementers face the challenge of educating facility managers about how to use demand response, as well as how to incorporate building tune-ups and power consumption and performance measurement to facilitate optimal energy management. However, developers are confident that OpenADR will become a standard language for smart grid technology products and systems.

"Controls and manufacturing companies are getting much more interested in how to improve energy efficiency and how to participate in demand response programs," Piette told the Alliance. "As we measure performance better and put in place more controls that can give us feedback on what our HVAC and lighting systems are doing, we will get better at DR and get better at energy efficiency," she added.

In October 2010, an industry represented alliance called as OpenADR Alliance was formed under leadership of Berkeley Lab, Honeywell, Pacific Gas and Electric Company, and Southern California Edison to advance OpenADR standards and its conformance activities among various stakeholders.

For More Information

Read more about OpenADR at http://openadr.lbl.gov (http://openadr.lbl.gov) , and check out NIST's smart grid interoperability standards project at http://www.nist.gov/smartgrid/ (http://www.nist.gov/smartgrid/) . Also read about the OpenADR Alliance (http://www.openadr.org/) , whose mission is to foster the development, adoption and compliance of teh OpenADR standards.

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